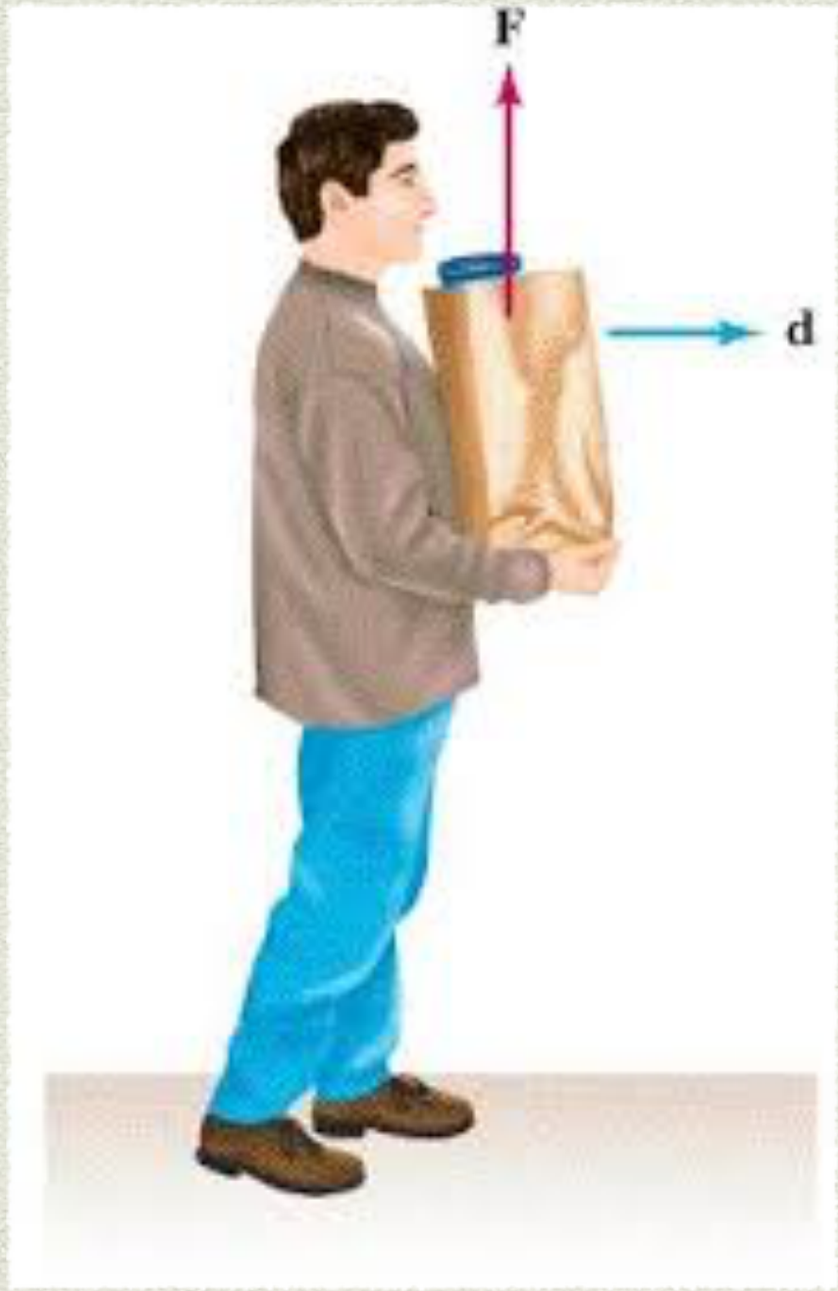
What is Energy?

Introduction to Energy

Work, Energy, & Power

Work is done when a force moves an object through a distance.

The ability to do work or cause change is called energy.



Work & Energy

When an object or organism does work on an object, some of its energy is transferred to that object. You can think of work then as the transfer of energy.

Energy is measured in joules, which is also how work is measured.

Power & Energy

If the transfer of energy is work, then power is the rate at which energy is transferred, or the amount of energy transferred in a unit of time.

Power = Energy transferred / Time

Power is involved whenever energy is being transferred. For example, a calm breeze's power is its rate of energy to lift a leaf a certain distance.

A tornado transfers the same amount of energy when it lifts a leaf the same distance. However, the tornado has a greater power than the breeze because it transfers energy to the leaf in less time.

Kinetic Energy

Two basic kinds of energy are kinetic energy and potential energy. Whether energy is kinetic or potential depends on whether an object is moving or not.

A moving object, such as the wind, can do work when it strikes another object and moves it some distance. Because the moving object does work, it has energy. The energy of motion is called kinetic energy.

Factors Affecting Kinetic Energy

The kinetic energy of an object depends on both its mass and its velocity. Kinetic energy increases as mass increases.

For example, think about rolling a bowling ball and a golf ball down a bowling lane at the same velocity. The bowling ball has more mass than the golf ball.

If both balls have the same velocity, the bowling ball is more likely to knock down the pins because it has more kinetic energy than the golf ball.

Kinetic energy also increases when velocity increases. For example, suppose you have two identical bowling balls and your roll one ball so it moves at a greater velocity than the other.

You must throw the ball harder to give it the greater velocity. In other words, you transfer more energy to it. Therefore, the faster ball has more kinetic energy.

The more work you do on an object, the more energy you give that object. The more mass a moving object has, the more kinetic energy it has. Kinetic energy also increases when velocity increases.

Calculating Kinetic Energy

$$K.E. = \frac{1}{2}mv^2$$

m = mass (kg)

v = velocity (m/s)

$K.E.$ = kinetic energy (J)

There is a mathematical relationship between kinetic energy, mass, and velocity.

Kinetic energy = 1/2 X Mass X Velocity^2

Changing the velocity of an object will have a greater effect on its kinetic energy than changing its mass by the same factor. This is because velocity is squared in the equation.

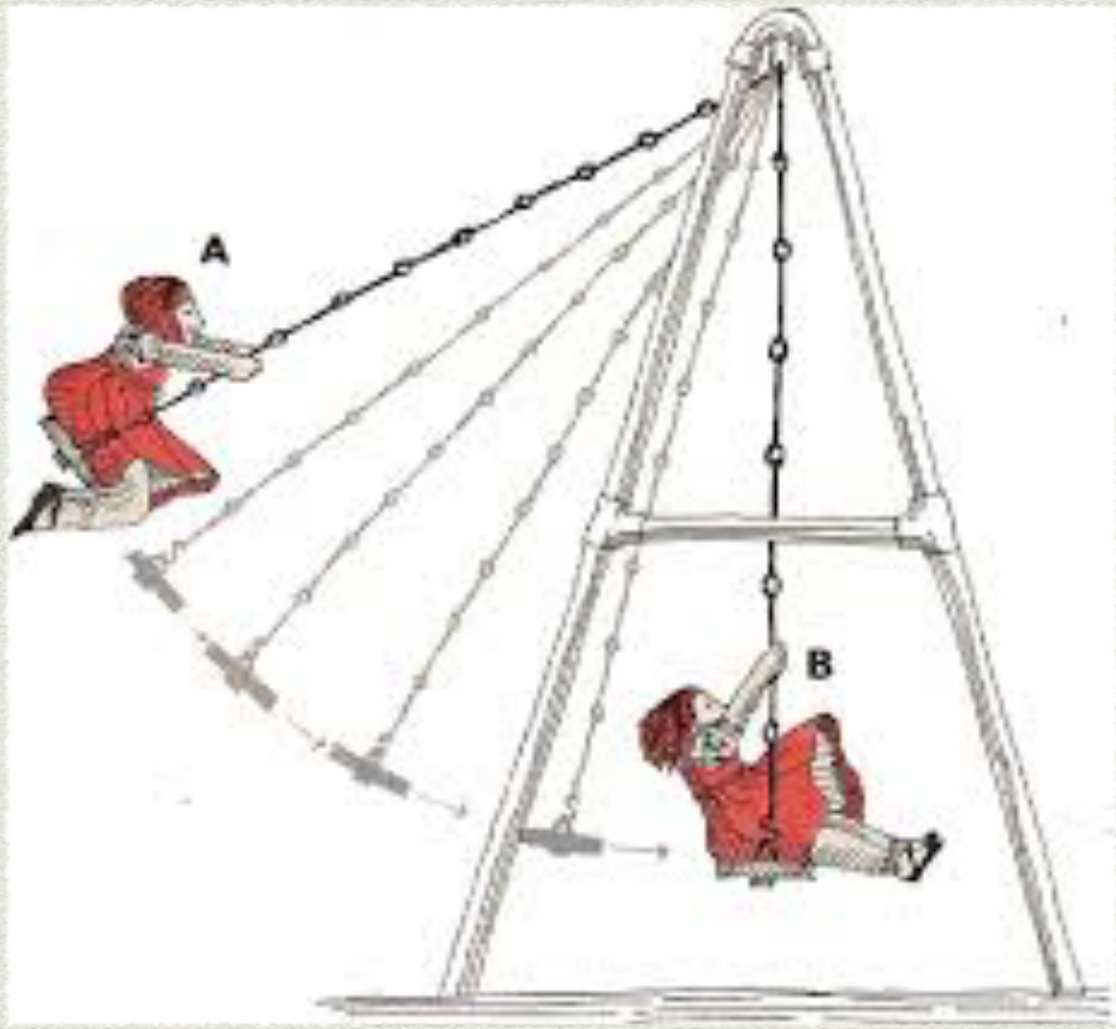
For instance, doubling the mass of an object will double its kinetic energy. But doubling its velocity will quadruple its kinetic energy.

Potential Energy

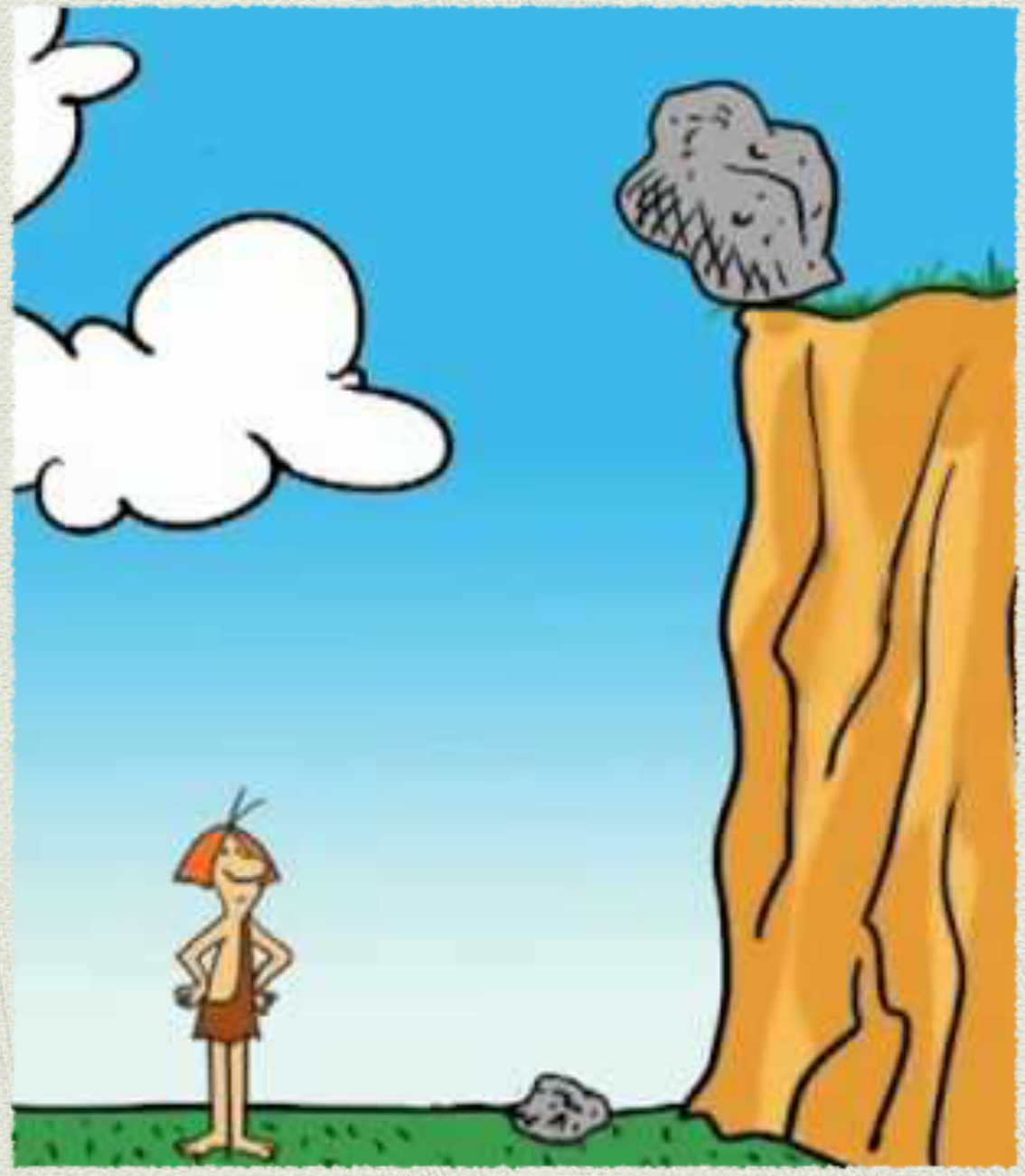
An object does not have to be moving to have energy. Some objects have stored energy as a result of their positions or shapes. When you lift a book up to your desk from the floor or compress a spring to wind a toy, you transfer energy to it.

The energy you transfer is stored, or held in readiness. It might be used later when the book falls to the floor or the springs unwinds.

Energy that is stored and held in readiness is called potential energy. This type of energy has the potential to do work.



Gravitational Potential Energy



Potential energy that depends on height is gravitational potential energy. The gravitational potential energy of an object is equal to the work done to lift it.

Work = force X distance.

The force you use to lift the object is equal to its weight. The distance you move the object is its height. You can calculate an object's gravitational potential energy using this formula:

Gravitational Potential Energy = Weight X Height

For example, a skier weighs 500 - newtons. If the ski jump is 40 meters high, then the skier has 500 - newtons X 40 meters, or 20,000 J, of gravitational potential energy.

The more an object weighs, or the greater the object's height, the greater its gravitational potential energy. At the same height, a 600 - newton skier has more gravitational potential energy than the 500 - newton skier.

Similarly, a 500 – newton skier has more gravitational potential energy on a high ski jump than a low one.

Elastic Potential Energy

When you stretch an object, you give it a different kind of potential energy. The potential energy associated with objects that can be stretched or compressed is called elastic potential energy.

For example, when an archer pulls back an arrow, the bow changes shape. The bow now has potential energy. When the archer releases the string, the stored energy sends the arrow flying to its target.

Keywords: English - Spanish

Energy - Energía

Work - Trabajo

Power - Poder

Joules - Julios

Kinetic Energy - Energía Cinética

Potential Energy - Energía Potencial

Gravitational Potential Energy - Energía Potencial Gravitacional

Elastic Potential Energy - Energía Potencial Elástica